

Indiana Utility Regulatory Commission

Electric Utility Reliability Report: 2002 – 2016

Each investor-owned electric utility (IOU) in Indiana is required to file a reliability report annually with the Indiana Utility Regulatory Commission (IURC) in compliance with 170 IAC 4-1-23(e). This document serves as a compilation of the reports filed for 2016 and provides historical data beginning in 2002. The data are provided in summary tables early in the report and in complete tables at the end. Also included is a graph for each IOU illustrating the trends experienced from 2002 through 2016.

The utilities provide the following three reliability indices in their reports:

- System Average Interruption Frequency Index (SAIFI): the average number of interruptions per customer. It is calculated by dividing the total number of customer interruptions by the total number of customers.
- System Average Interruption Duration Index (SAIDI): the average minutes of interruption per customer. It is calculated by dividing the sum of all customer interruption durations (in minutes) by the total number of customers.
- Customer Average Interruption Duration Index (CAIDI): the average duration of interruptions or the time to restore service to interrupted customers. It is calculated by dividing SAIDI by SAIFI.

Each utility reports its reliability indices with and without major events. Major events are storms or weather events that are more destructive than normal storm patterns. It is important to note that the same definition of “major event” is not used by all utilities. However, Indiana IOUs define a major event day (MED) using a standard provided by the Institute of Electrical and Electronics Engineers (IEEE Standard 1366). It involves the calculation of a threshold in terms of SAIDI minutes based on data from the previous five years. Any day the threshold is exceeded is a MED. The provision of indices that exclude major events normalizes the data by eliminating interruptions over which the utilities have little or no control. In addition, there can be great variation in major events (e.g., tornadoes, floods, ice storms), the resulting damage, and the time necessary to make repairs.

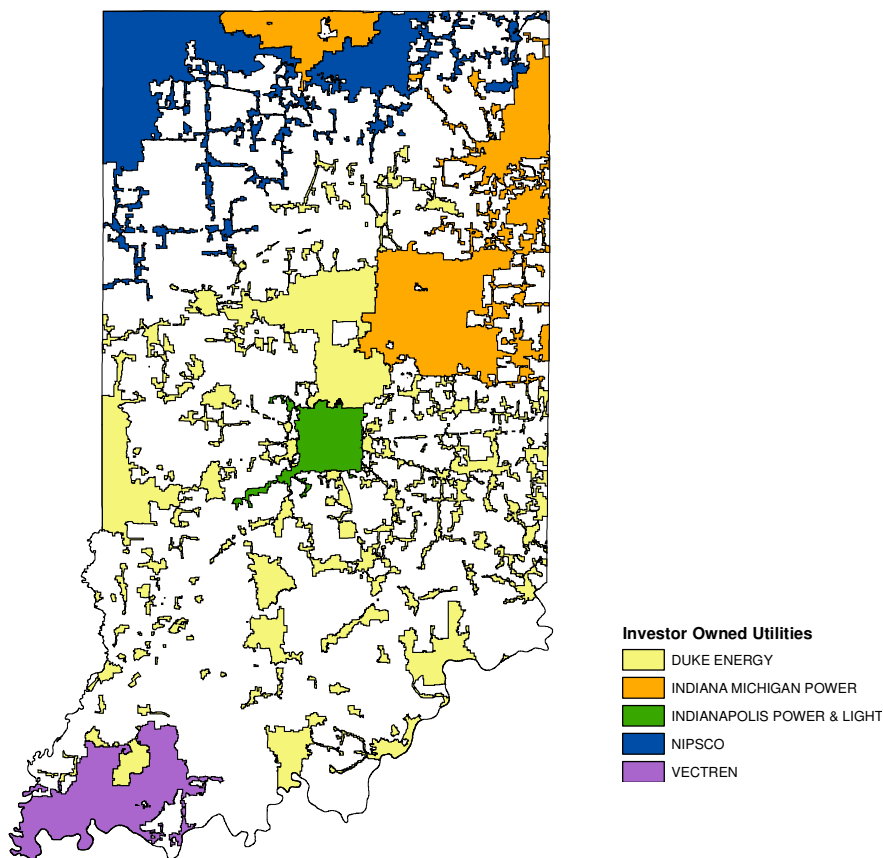
The following table summarizes the number of MEDs each IOU reported for 2016. Although not required, four of the IOUs also provided the number of major events, which indicates that one storm system can potentially cause multiple major event days.

Utility Company	Major Event Days	Major Events
Duke Energy Indiana	4	4
Indiana Michigan Power	3	3
Indianapolis Power & Light	9	Not provided
NIPSCO	10	4
Vectren	3	3

Causes of interruptions other than MEDs can include equipment failures, accidents, and weather events that do not meet the MED threshold. As an example, NIPSCO stated it experienced an additional 68 weather events it considered severe, but that did not meet the MED threshold.

The reliability indices should only be used to evaluate the performance of an individual utility company over time. Direct comparisons of the utilities' indices should be avoided. The size and geography of service territories and the distribution of customers within them can vary greatly among the utilities, complicating direct comparison of the indices. A map showing the service territories of the Indiana IOUs is shown below. All other factors being equal, IOUs with compact service areas like Vectren and Indianapolis Power and Light (IPL) should be able to respond to interruptions faster and individual repairs could put a greater number of customers back online. That may, at least partially, explain Vectren and IPL's lower numbers for the duration indices of SAIDI and CAIDI.

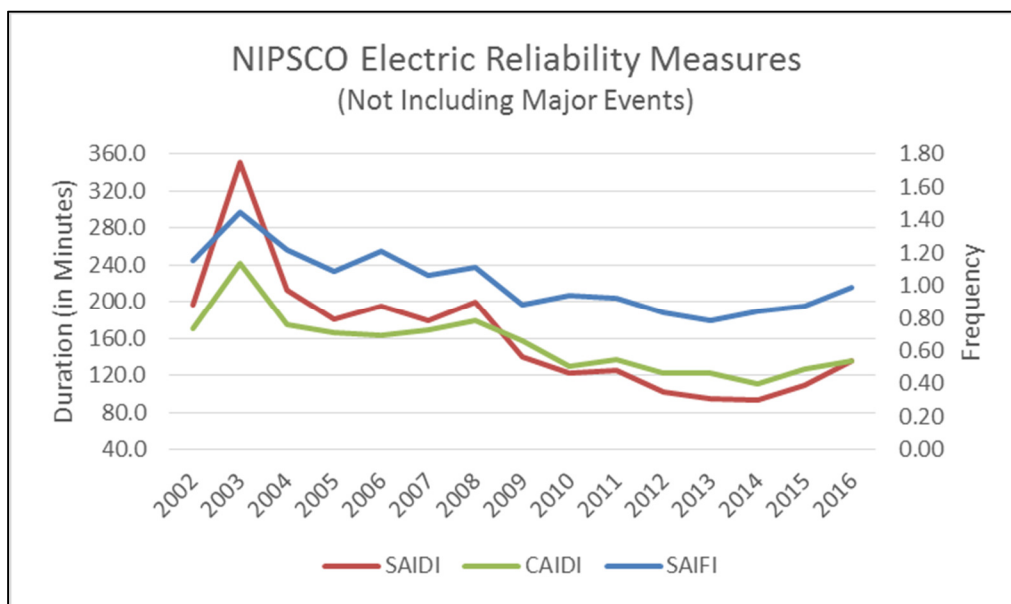
Service Territories of Indiana Investor Owned Utilities

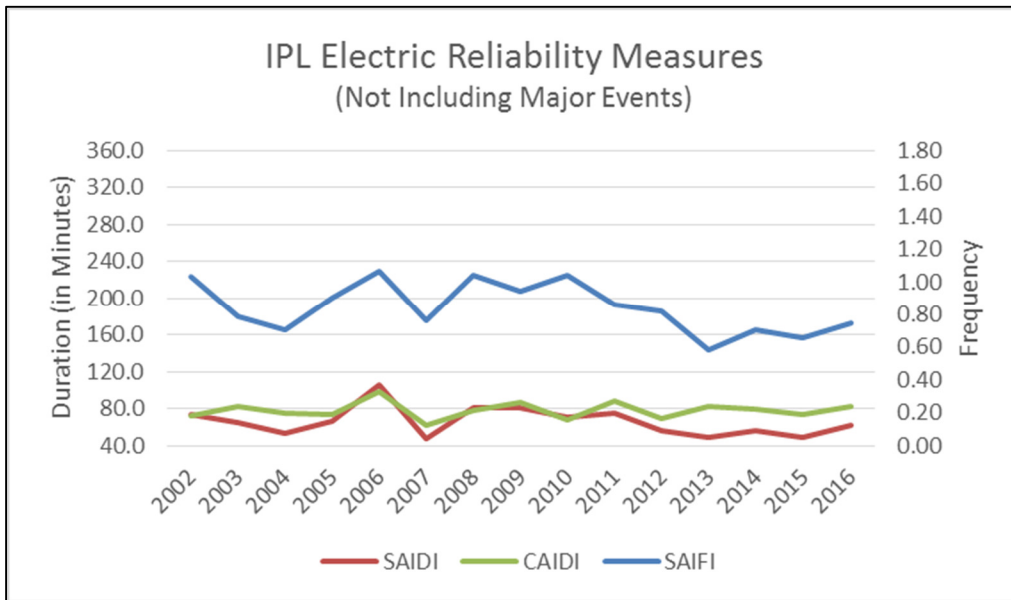
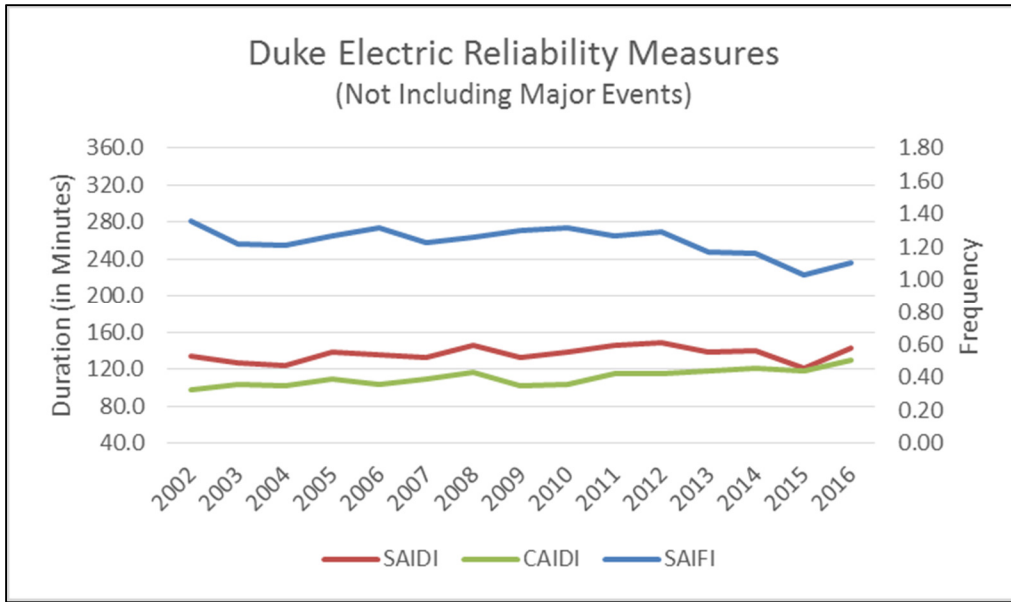


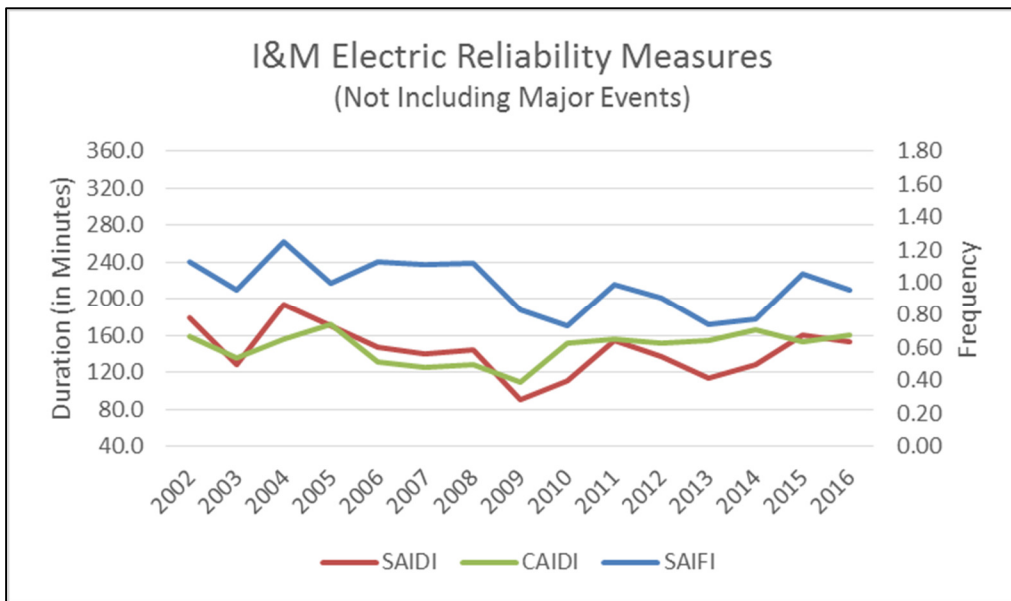
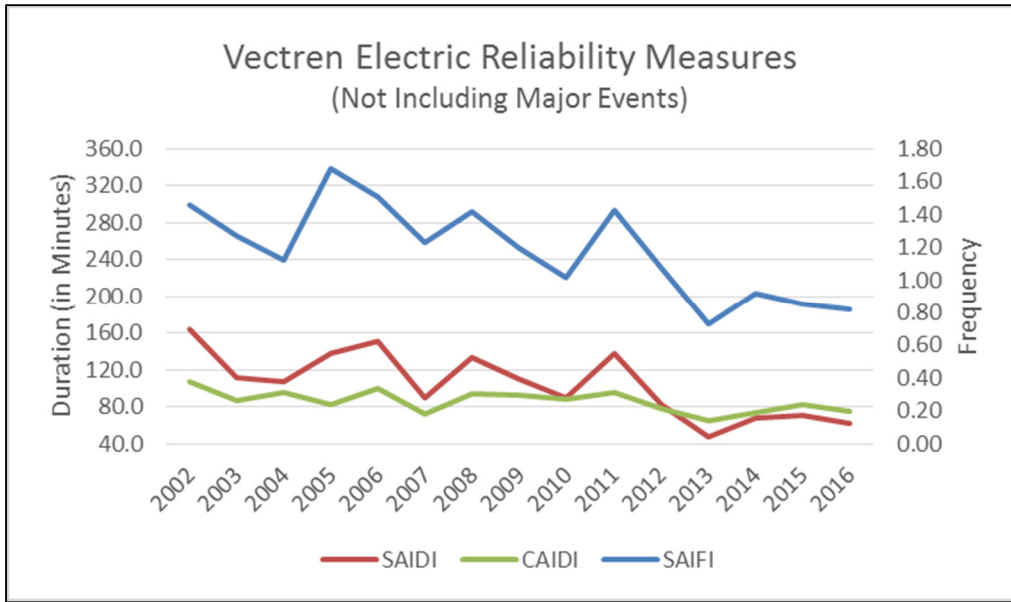
The following table provides the 2016 reliability indices without MEDs for the Indiana IOUs and a comparison of the 2016 indices with their averages for the previous five years. Details for 2002 through 2016 are provided in the tables on pages 6 and 8.

Comparison of 2016 Indices to 2011-2015 Average Indices (Without Major Events)				
	2016	2011-2015 Avg	Variance 2016 - Avg	% Variance 2016 - Avg
NIPSCO				
SAIFI	0.99	0.85	0.14	17%
SAIDI	135.00	105.40	29.60	28%
CAIDI	136.00	124.00	12.00	10%
Duke				
SAIFI	1.10	1.18	-0.08	-7%
SAIDI	142.49	138.80	3.69	3%
CAIDI	129.60	117.30	12.30	10%
IPL				
SAIFI	0.74	0.73	0.02	2%
SAIDI	61.64	57.11	4.53	8%
CAIDI	82.85	78.78	4.07	5%
Vectren				
SAIFI	0.82	1.00	-0.18	-18%
SAIDI	61.30	81.12	-19.82	-24%
CAIDI	74.40	78.84	-4.44	-6%
I&M				
SAIFI	0.95	0.89	0.06	7%
SAIDI	152.90	138.34	14.56	11%
CAIDI	160.80	155.84	4.96	3%

The following graphs show the indices without MEDs of the five IOUs from 2002 through 2016.

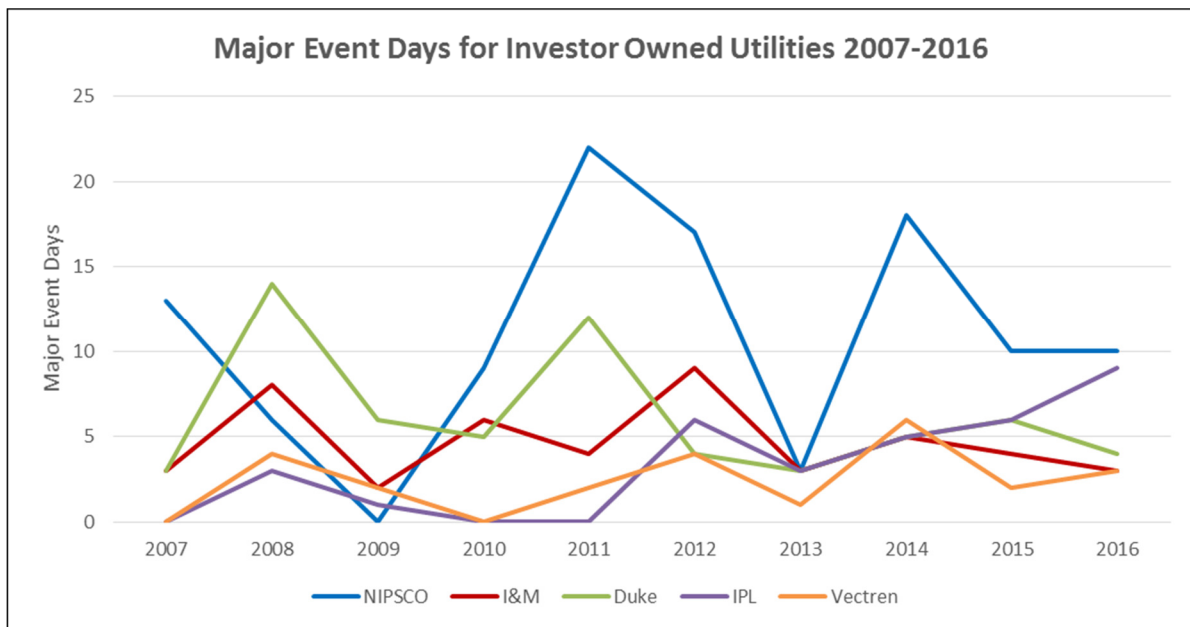






Electric Reliability Not Including Major Events*															
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
NIPSCO	1.15	1.45	1.22	1.09	1.21	1.06	1.11	0.88	0.94	0.92	0.83	0.78	0.84	0.87	0.99
	196.20	350.40	213.00	181.00	196.00	180.00	199.00	140.00	122.00	126.00	102.00	95.00	94.00	110.00	135.00
	170.60	241.70	175.00	166.00	163.00	169.00	179.00	158.00	130.00	137.00	123.00	122.00	111.00	127.00	136.00
Duke	1.36	1.22	1.21	1.27	1.32	1.23	1.26	1.30	1.32	1.27	1.29	1.17	1.16	1.03	1.10
	134.00	127.00	124.00	138.00	136.00	133.00	146.00	133.00	138.00	146.00	149.00	138.00	140.00	121.00	142.49
	98.00	103.00	102.00	109.00	103.00	109.00	116.00	102.00	104.00	115.00	115.00	118.00	121.00	117.50	129.60
IPL	1.03	0.79	0.71	0.90	1.07	0.76	1.04	0.94	1.04	0.86	0.82	0.58	0.71	0.66	0.74
	73.80	65.70	53.20	66.50	105.15	46.99	80.84	81.13	71.15	75.08	56.71	48.33	56.71	48.70	61.64
	72.00	83.20	74.50	73.90	98.01	61.70	77.68	86.23	68.13	87.63	69.57	82.78	80.24	73.70	82.85
Vectren	1.46	1.27	1.12	1.68	1.51	1.23	1.42	1.20	1.02	1.43	1.07	0.73	0.92	0.85	0.82
	164.00	111.00	106.80	137.00	151.00	89.00	133.00	110.00	89.70	137.00	83.00	47.50	67.20	70.90	61.30
	107.00	87.00	95.40	82.00	100.00	72.00	94.00	92.00	88.30	95.70	77.50	65.10	73.00	82.90	74.40
I&M	1.12	0.95	1.25	1.00	1.12	1.11	1.12	0.83	0.74	0.99	0.91	0.74	0.77	1.05	0.95
	179.10	128.50	194.10	170.70	146.70	139.10	143.70	90.30	111.30	153.70	136.70	113.70	127.50	160.10	152.90
	159.30	135.00	155.60	171.10	130.60	125.60	128.60	108.80	150.90	156.10	151.10	154.00	165.40	152.60	160.80
Notes															
SAIFI: System Average Interruption Frequency Index; (# of customers who experience outage) / (total # of customers)															
SAIDI: System Average Interruption Duration Index; (duration or time of service interruptions) / (total # of customers)															
CAIDI: Customer Average Interruption Duration Index; (SAIDI) / (SAIFI)															
*Major events are storms or w weather events that are more destructive than normal storm patterns. The same definition of "major event" is not used by all utilities.															
**NIPSCO's 2007 report updated values for 2004-2006 based on accepted industry standard IEEE Std 1366 - how ever, the above values reflect the original reports.															

Major Event Days for Investor Owned Utilities 2007-2016											
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Mean
NIPSCO	13	6	0	9	22	17	3	18	10	10	10.8
Duke	3	14	6	5	12	4	3	5	6	4	6.2
IPL	0	3	1	0	0	6	3	5	6	9	3.3
Vectren	0	4	2	0	2	4	1	6	2	3	2.4
I&M	3	8	2	6	4	9	3	5	4	3	4.7



Electric Reliability Including Major Events*															
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
NIPSCO															
	SAIFI	1.41	1.65	1.38	1.24	1.40	1.80	0.88	1.36	1.38	1.44	1.45	1.53	1.16	1.26
	SAIDI	542.40	498.00	317.00	258.00	317.00	882.00	140.00	505.00	371.00	428.00	520.00	603.00	248.00	231.00
CAIDI	384.70	301.80	229.00	208.00	227.00	480.00	490.00	158.00	372.00	269.00	297.00	359.00	395.00	214.00	184.00
Duke															
	SAIFI	1.57	1.58	1.66	1.59	1.63	1.41	1.76	1.58	2.07	1.52	1.38	1.31	1.27	1.34
	SAIDI	170.00	201.00	255.00	282.00	203.00	178.00	689.00	195.00	630.00	216.00	257.00	186.00	211.00	289.79
CAIDI	109.00	128.00	153.00	177.00	125.00	126.00	278.00	166.00	124.00	304.00	143.00	187.00	142.00	166.10	216.69
IPL															
	SAIFI	1.17	0.90	0.81	0.90	1.07	1.54	1.10	1.04	0.86	1.04	0.71	0.96	0.94	1.17
	SAIDI	132.90	98.00	76.70	66.50	105.15	46.99	358.98	158.39	71.15	124.92	92.30	189.98	219.45	232.23
CAIDI	113.30	108.40	94.10	73.90	98.01	61.70	232.96	144.63	68.13	87.63	119.66	130.01	198.63	233.12	198.48
Vectren															
	SAIFI	1.46	1.27	2.36	2.05	1.87	2.33	2.56	1.02	2.16	1.24	0.78	1.47	0.90	1.26
	SAIDI	164.00	111.00	932.40	376.00	241.00	89.00	859.00	2889.00	89.70	711.30	117.30	314.30	81.30	260.90
CAIDI	107.00	87.00	394.70	185.00	128.00	72.00	369.00	1126.00	88.30	329.90	94.90	76.60	213.50	90.60	206.90
I&M															
	SAIFI	1.68	1.56	1.42	1.31	1.24	1.63	0.91	0.98	1.12	1.39	0.96	0.96	1.24	1.06
	SAIDI	930.60	594.20	291.40	1131.60	222.00	199.40	1164.30	121.50	392.30	258.00	1071.20	374.50	390.30	255.00
CAIDI	553.50	380.20	204.70	863.00	178.70	161.20	712.80	133.20	399.80	230.30	772.50	392.00	317.80	313.90	240.60
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